

CLAIMS: I claim:

1. A machine used in computing one or more sums of products wherein at least one of said sums of products is not a desired product of two numbers, comprising:
  - a. a first real number represented in a first finite-precision numeric format
  - b. a second real number represented in a second finite-precision numeric format
  - c. a third real number represented in a third finite-precision numeric format
  - d. first real multiplier means for computing a first set of intermediate terms and a first product, said first product being the product of said first real number and said second real number
  - e. second real multiplier means for computing a second product, said second product being the product of said first real number and said third real number and said second real multiplier means using one or more members of the set consisting of said first product and said first set of intermediate termswhereby said first real multiplier means and said second real multiplier means share computation and can have lower implementation cost than if said first product and said second product were computed separately.
2. The machine of claim 1 wherein said second real multiplier means cannot compute the product of said first real number and said second real number, whereby said second real multiplier means can have lower implementation cost than if it must also be able to compute the product of said first real number and said second real number.
3. The machine of claim 1 wherein said first real multiplier means cannot compute the product of said first real number and said third real number, whereby the first real multiplier means can have lower implementation cost

than if it must also be able to compute the product of said first real number and said third real number.

4. The machine of claim 1 wherein said second real multiplier means does not use said first product, whereby said first product and said second product may be computed in a parallel manner.
5. The machine of claim 1 further including additive means for adding said first product and said second product to a first product sum, where said first product sum is not a desired product of two numbers, whereby said first product, said second product, and said first product sum may be computed with lower cost than if each is computed separately.
6. The machine of claim 1 further including first additive means for adding said first product to a first product sum and second additive means for adding said second product to a second product sum, where said first product sum and said second product sum are separate product sums such that one or both of the following properties hold:
  - a. there is at least one sum of products to which said first product sum contributes and to which said second product sum does not contribute
  - b. there is at least one sum of products to which said second product sum contributes and to which said first product sum does not contributewhereby said machine of claim 1 can be used for computing and adding the contribution of said first real number to two separate outputs of a signal processing transform.
7. A machine used in computing one or more sums of products wherein at least one of said sums of products is not a desired product of two numbers, comprising:
  - a. a first number in a first finite-precision numeric format
  - b. a second number in a second finite-precision numeric format

- c. a third number in a third finite-precision numeric format
- d. multiplier means for computing a first product equal to the product of said first number and said second number and for computing a second product equal to the product of said first number and said second number, where at least one of the calculation results used in computing said first product is also used in computing said second product

whereby said multiplier means computes at least two products using at least one shared calculation result.

8. The machine of claim 7, in which:

- a. said second product is not equal to the product of said first number and the complex conjugate of said second number except in the following cases:
  - i. said second number is equal to the complex conjugate of said third number
  - ii. said first number is zero
- b. said second product is not equal to the product of said second number and the complex conjugate of said first number except in the following cases:
  - i. said first number is real, and said second number is equal to said third number
  - ii. said first number is zero

whereby said multiplier means is not a multiple-output multiplier which computes the product of two numbers and the product of two numbers with one of the numbers conjugated.

9. A method used in computing one or more sums of products wherein at least one of said sums of products is not a desired product of two numbers, comprising:
- a. first real multiplication of a first real number represented in a first finite-precision numeric format by a second real number represented in a second finite-precision numeric format, producing: